Pt2 *[48 marks]*

A geometric sequence has a first term of $\frac{8}{3}$ and a fourth term of 9.

1a. Find the common ratio. *[2 marks]*

1b. Write down the second term of this sequence. *[1 mark]*

1c. The sum of the first k terms is greater than 2500. *[3 marks]*

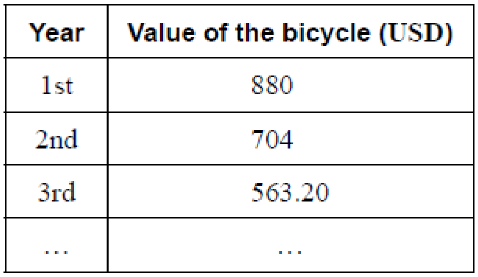
Find the smallest possible value of k.

John purchases a new bicycle for 880 US dollars (USD) and pays for it with a Canadian credit card. There is a transaction fee of 4.2 % charged to John by the credit card company to convert this purchase into Canadian dollars (CAD).

The exchange rate is 1 USD = 1.25 CAD.

2a. Calculate, in CAD, the total amount John pays for the bicycle. *[3 marks]*

John insures his bicycle with a US company. The insurance company produces the following table for the bicycle’s value during each year.



Year	Value of the bicycle (USD)
1st	880
2nd	704
3rd	563.20
…	…

The values of the bicycle form a geometric sequence.

2b. Find the value of the bicycle during the 5th year. **Give your answer to two decimal places**. *[3 marks]*

2c. Calculate, in years, when the bicycle value will be less than 50 USD. *[2 marks]*

During the 1st year John pays 120 USD to insure his bicycle. Each year the amount he pays to insure his bicycle is reduced by 3.50 USD.

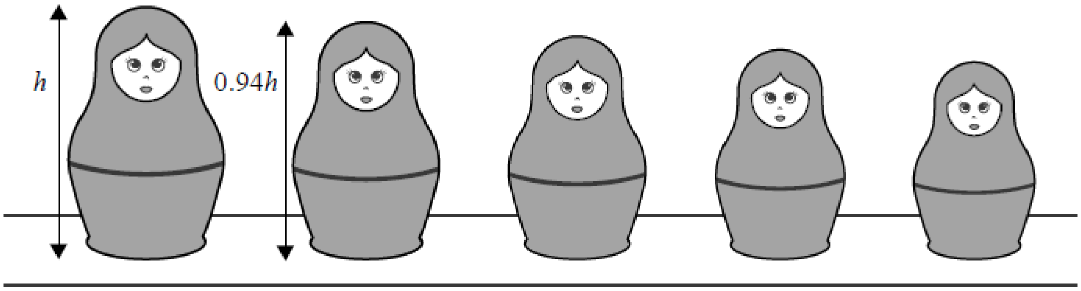
2d. Find the total amount John has paid to insure his bicycle for the first 5 years. *[3 marks]*

2e. John purchased the bicycle in 2008. *[3 marks]*

Justify why John should not insure his bicycle in 2019.

Matryoshka dolls, or Russian dolls, are similarly designed dolls which open up and fit inside each other.

The largest set of these type of dolls is a 51 piece set which was completed in 2003. The height of the largest piece in this set is 54 cm. The heights of successive smaller dolls are 94 % of the preceding larger doll, as shown.



3a. Find the height of the smallest doll in this set. *[3 marks]*

3b. Find the **total** height if all 51 dolls were placed one on top of another. *[3 marks]*

Sergei is training to be a weightlifter. Each day he trains at the local gym by lifting a metal bar that has heavy weights attached. He carries out successive lifts. After each lift, the same amount of weight is **added** to the bar to increase the weight to be lifted.

The weights of each of Sergei’s lifts form an arithmetic sequence.

Sergei’s friend, Yuri, records the weight of each lift. Unfortunately, last Monday, Yuri misplaced all but two of the recordings of Sergei’s lifts.

On that day, Sergei lifted 21 kg on the third lift and 46 kg on the eighth lift.

4a. For that day find how much weight was added after each lift. *[2 marks]*

4b. For that day find the weight of Sergei’s first lift. *[2 marks]*

4c. On that day, Sergei made 12 successive lifts. Find the total combined weight of these lifts. *[2 marks]*

A new café opened and during the first week their profit was $60.

The café’s profit increases by $10 every week.

5a. Find the café’s profit during the 11th week. *[3 marks]*

5b. Calculate the café’s **total** profit for the first 12 weeks. *[3 marks]*

A new tea-shop opened at the same time as the café. During the first week their profit was also $60.

The tea-shop’s profit increases by 10 % every week.

5c. Find the tea-shop’s profit during the 11th week. *[3 marks]*

5d. Calculate the tea-shop’s **total** profit for the first 12 weeks. *[3 marks]*

5e. In the mth week the tea-shop’s **total** profit exceeds the café’s **total** profit, for the first time since they both opened. *[4 marks]*

Find the value of m.

© International Baccalaureate Organization 2020
International Baccalaureate® - Baccalauréat International® - Bachillerato Internacional®

Printed for INTL SCH OF MILAN SEC